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14.	14. APPLICABLE DOCUMENTS											
18. ATS TITLE TCs installation on Star Tracker												
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			THE INST	ALLA'		N OF THE L IERMOCO	FLIGHT OR NO OUPLES;	DN-FLIGHT				
			AS A GENER	AL RE	QUI	REMENTS DONE	S ALL THE STE	EPS SHALL BE				
			IN A CO	NEDO				NDOOM				
			- IN A CO	NTKO	LLE	D ENVIRO	NMENT (CLEA	AN ROOM);				
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<sup>28.</sup> Corrado Gargiulo (INFN)					<sup>29.</sup> Giovanni Ambi	rosi (INFN)						
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<sup>30.</sup>	seph I	Burger (	(AMS thermal)				Serena Borsini	(INFN)				

## 16 5. Page TCS000001-1-15 **AMS-02 TASK SHEET (ATS)** 4. ATS NO **CONTINUATION PAGE** 6. MOD NO. VERIFICATION 20 OPER 21 OPERATIONS SEQ. NO. (Print, Type, or Write Legibly) 22. TECH 23. QA/DV The purpose of this ATS is to describe how and where to fix the flight or nonflight thermocouples on Star tracker. TRD M-STRUCTURE VACUUM CASE (PARTIAL) OUTER RING INNER RING STAR TRACKERS CAMERAS VACUUM CASE UPPER CONICAL FLANGE y AMS (PARTIAL) PORT STARBOARD RAM The TCs are the thermal sensors that will be used during the general AMS02 thermal-vacuum test at ESTEC. Thermocouples accessible after the thermal vacuum test will be removed. These are called non-flight thermocouples. Thermocouples not accessible after the TVTB test are called flight thermocouples. The cables of these sensors will be cut as much as possible near the TCs head, after the thermo-vacuum test at ESTEC. The Project Engineer on site has the option to recorder steps as required. 1. Open this ATS 2. HARDWARE AVAILABILITY AND IDENTIFICATION Before starting the installation check the availability of the following hardware and fill the following tables with all the technical information. 2.1 TCs sensors list

#### 16 5. Page TCS000001-1-15 **AMS-02 TASK SHEET (ATS)** 4. ATS NO. **CONTINUATION PAGE** 6. MOD NO. VERIFICATION 20. OPER SEQ. NO. 21. OPERATIONS (Print, Type, or Write Legibly) 22. TECH 23. QA/DV Part Cable Temporary(T)/ Sensor Sensor Note number number length (m) Permanent (P) type 5 TC 1 ST TC #1 P 5 2 TCST TC #2 P 5 3 TC ST TC #3 P 5 4 TC ST TC #4 Т 5 ST TC #5 Т 6 ST TC #6 Т 7 ST TC #7 T 8 ST TC #8 2.2 TCs datasheet. 2.3 Reader for TCs verification: Type: Keythley 2000 El Pool 0113 0055 Part Number: 1088916 2.4 Instruction sheet/manual for use of reader (multimeter) 2.5 Kapton Tape: Tape P/N Lot Number **Expiration Date** Note 3M 1205 25 mm 8218-07 N/A 2.6 Aluminum tape: Tape P/N Lot Number **Expiration Date** Note 3M 425 50 mm 8227-21-68 April 24, 2010

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2.7	Tool to c	lean the Star Tra					22. TECH	23. QA/I
2.8	Label for		oton tape as lab		anent marker to	write the		
2.9	Isopropyl	alcohol.						
2.10	Antistatio	c cloth.						
2.11	Camera							
	Before to in handheld re		n the detector, or are the results v	check their co with the tempe	rrect functioning rature in the cle couple readout			
3.1	Take the	reader.						
3.2	Take all t	he available TC	es.					
3.3	directly):	he clean room t			Temperature value (°C)	OK		
		ST TC #1	28.2		29.3	OK		
		ST TC #2	26.2		29.1	OK		
		ST TC #3	24.8		27.8	OK		
		ST TC #4	26.1		31.8	OK		
4.	ST TC							
4.								

# AMS-02 TASK SHEET (ATS) CONTINUATION PAGE 5. Page 5 of 16 TCS000001-1-15 6. MOD NO.

AMIS-UZ TASK STIELT (ATS)		4. ATS NO.	
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4.1	#1 INSTALLATION  SURFACE CLEANING According to the Figure 1, clean the substrate surapproximately) for the sensor installation.	face (3 cm x 3 cm	
4.1.1	The location of the thermocouple is shown in Figu	ure 2.	
4.1.2	AL Tape (3M 425)  ALTape (3M 425)  Kaptor around stuck  Figure 1 – General TC mounting		
	Figure 2 – ST TC #1 position on the electron	nic frame interface	

## 16 5. Page TCS000001-1-15 **AMS-02 TASK SHEET (ATS)** 4. ATS NO. **CONTINUATION PAGE** 6. MOD NO. VERIFICATION 20. OPER 21 OPERATIONS SEQ. NO. (Print, Type, or Write Legibly) 22. TECH 23. QA/DV 4.2 SENSOR FIXATION Take one of the available TCs and fill the table: 4.2.1 TC identification number Part number Location of the TC on electronic frame interface ST TC #1 N/A As in Figure 4.2.2 Wrap the thermocouple in a small piece of Kapton tape to insulate it and position it on the subdetector OR put a piece of Kapton tape on the subsystem surface, on the clean area, center the thermocouple on this tape, and fix it in place with a larger piece of Kapton tape. 4.2.3 Take a photo to show the exact configuration. 4.2.4 Cover the thermocouple and Kapton tape with a larger piece of aluminum tape to fix it firmly in place (recommended AL tape size: ~2.5cmx2.5cm) 4.2.5 Take a photo 4.2.6 Record the photos files numbers: ST TC#1, TC fixation photos files numbers STTC#1\_sect\_4.2.3.jpg STTC#1\_sect\_4.2.5a.jpg STTC#1\_sect\_4.2.5b.jpg 4.2.7 According to the ST installation position, report the cabling layout in the Figure 3. Fix the cable using ALUMINUM tape. Typically one piece of tape every 20 cm. WARNING BEFORE TO PUT THE ALUMINUM TAPE, CLEAN THE SURFACE WITH ISOPROPYL ALCOHOL

### 16 5. Page TCS000001-1-15 **AMS-02 TASK SHEET (ATS)** 4. ATS NO. **CONTINUATION PAGE** 6. MOD NO. VERIFICATION

22. TECH

23. QA/DV

21. OPERATIONS

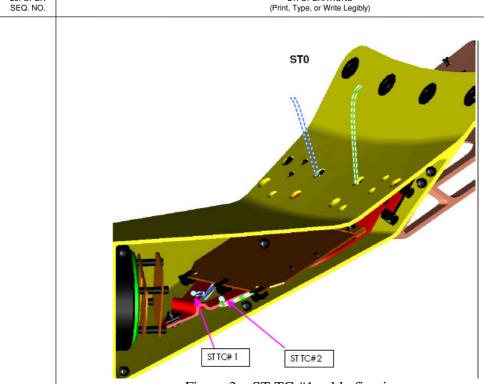


Figure 3 – ST TC #1 cable fixation.

- 4.2.8 Take pictures of the cables layout and record the photos files numbers: STTC#1\_sect\_4.2.8a.jpg ST TC #1, cable fixation photos files numbers: STTC#1\_sect\_4.2.8b.jpg
- 4.3 TC IDENTIFICATION.

20. OPER

Put the TC identification number "ST TC #1" 10 cm far from the cable end using the cable label.

If the thermocouple and cable on AMS will be hidden later, place a second label near where the cable will emerge, if this location is known.

4.4 TC VERIFICATION AFTER INSTALLATION

Check the functionality of the TC and fill the table:

TC identification number	Part number	Measured value	Datasheet value	Temperature value (°C)	ОК
ST TC #1	N/A	24.0		24.9	OK

4.5 Touch TC head with gloved hand to check that temperature rises.

## 16 5. Page TCS000001-1-15 **AMS-02 TASK SHEET (ATS)** 4. ATS NO. **CONTINUATION PAGE** 6. MOD NO. VERIFICATION 20. OPER SEQ. NO. 21. OPERATIONS (Print, Type, or Write Legibly) 22. TECH 23. QA/DV 5. ST TC #2 INSTALLATION 5.1 SURFACE CLEANING According to the Figure 4, clean the substrate surface (3 cm x 3 cm approximately) for the sensor installation. 5.1.1 The location of the thermocouple is shown in Figure 5. 5.1.2 Clean the surface using the cloth paper and the Isopropyl alcohol. AL Tape (3M 425) Kapton tape (either folded around TC or bottom piece stuck on surface first) **AMS** Figure 4 – General TC mounting technique STTC#1 STTC#2 Figure 5 – ST TC #2 position on the electronic frame interface

SENSOR FIXATION

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	AMS-02 TASK SHEET (A	4. ATS NO.	TCS(	000001-1	-15			
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5.2.1	Take one of the available T	Cs and fill the tab	ole:					
	TC identification number	Part number	Location of the TO electronic frame in					
	ST TC #2	N/A	As in Figu	re				
5.2.2	Wrap the thermocouple in a sma it on the subdetector OR put a p the clean area, center the thermo- larger piece of Kapton tape.	piece of Kapton ta	pe on the subsystem	surface, on				
5.2.3	Take a photo to show the exact	configuration.						
5.2.4	Cover the thermocouple and Ka fix it firmly in place (recommen							
5.2.5	Take a photo							
5.2.6	Record the photos files numbers ST TC #2, TC fixation photos fi	iles numbers S	STTC#2_sect_5.2.3.j STTC#2_sect_5.2.5a STTC#2_sect_5.2.5b	.jpg				
5.2.7	According to the Star tracker installation position, report the cabling layout in the Figure 6. Fix the cable using ALUMINUM tape. Typically one piece of tape every 20 cm.							
		WARNING						
	BEFORE TO PUT THE A WITH	ALUMINUM TA ISOPROPYL A		SURFACE				

# AMS-02 TASK SHEET (ATS) CONTINUATION PAGE 4. ATS NO. 6. MOD NO. VERIFICATION

22. TECH

23. QA/DV

20. OPER SEQ. NO.

STO

STO

SITC# 1

SITC# 2

Figure 6 – ST TC #2 cable fixation.

- 5.2.8 Take pictures of the cables layout and record the photos files numbers: ST TC #2, cable fixation photos files numbers: STTC#2\_sect\_5.2.8a.jpg STTC#2\_sect\_5.2.8b.jpg
- 5.3 TC IDENTIFICATION.

Put the TC identification number "ST TC #2" 10 cm far from the cable end using the cable label.

If the thermocouple and cable on AMS will be hidden later, place a second label near where the cable will emerge, if this location is known.

5.4 TC VERIFICATION AFTER INSTALLATION

Check the functionality of the TC and fill the told

Check the functionality of the TC and fill the table:

TC identification number	Part number	Measured value	Datasheet value	Temperature value (°C)	OK
ST TC #2	N/A	23.8		25.1	OK

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	AMS-02 TASK SHEET (ATS)	4. ATS NO.		S000001-1	
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5.5	Touch TC head with gloved hand to check that ter	mperature rises.		22. TECH	23. QA/DV
6.	ST TC #3 INSTALLATION				
6.1	SURFACE CLEANING According to the Figure 7, clean the substrate surf approximately) for the sensor installation.	Face (3 cm x 3 cm			
6.1.1	The location of the thermocouple is shown in Figu	ire 8.			
6.1.2	around	tape (either folded TC or bottom piece ( on surface first)			
	ST1  ST IC#4				

Figure 8 –ST TC #3 position on the electronic frame interface

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	AMS-02 TASK SHEET (ATS	4. ATS NO.	TCS	00001-1	-15	
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6.2	SENSOR FIXATION	, ,,,,,			22. TEOH	23. QA/DV
6.2.1	Take one of the available TCs a	and fill the table:				
	TC identification number	Part number	Location of the			
	ST TC #3	N/A	As in	Figure		
6.2.2	Wrap the thermocouple in a small proposition it on the subdetector OR pusurface, on the clean area, center the with a larger piece of Kapton tape.	ıbsystem				
6.2.3	Take a photo to show the exact con	figuration.				
6.2.4	Cover the thermocouple and Kaptor fix it firmly in place (recommended	num tape to				
6.2.5	Take a photo					
6.2.6	Record the photos files numbers: ST TC #3, TC fixation photos files					
6.2.7	According to the Star Tracker instal Figure 9. Fix the cable using Alumin 20 cm.					
		WARNING				
	BEFORE TO PUT THE ALUI WITH ISO					

## AMS-02 TASK SHEET (ATS) CONTINUATION PAGE 5. Page 13 of 16 TCS000001-1-15 6. MOD NO.

VERIFICATION 20. OPER 21. OPERATIONS SEQ. NO. (Print, Type, or Write Legibly) 22. TECH 23. QA/DV ST1 ST TC#3 ST TC#4 Figure 9 – ST TC #3 cable fixation. 6.2.8 Take pictures of the cables layout and record the photos files numbers: ST TC #3, cable fixation photos files numbers: STTC#3\_sect\_6.2.8.jpg TC IDENTIFICATION. 6.3 Put the TC identification number "ST TC #3" 10 cm far from the cable end using the cable label. If the thermocouple and cable on AMS will be hidden later, place a second label near where the cable will emerge, if this location is known. TC VERIFICATION AFTER INSTALLATION 6.4 Check the functionality of the TC and fill the table: TC Measured Datasheet Temperature Part identification OK number value value value (°C) number ST TC #3 N/A 23.6 25.2 OK Touch TC head with gloved hand to check that temperature rises. 6.5

## 14 16 5. Page TCS000001-1-15 AMS-02 TASK SHEET (ATS) 4. ATS NO. **CONTINUATION PAGE** 6. MOD NO. VERIFICATION 20. OPER SEQ. NO. 21. OPERATIONS (Print, Type, or Write Legibly) 22. TECH 23. QA/DV 7. ST TC #4 INSTALLATION 7.1 SURFACE CLEANING According to the Figure 10, clean the substrate surface (3 cm x 3 cm approximately) for the sensor installation. 7.1.1 The location of the thermocouple is shown in Figure 11. 7.1.2 Clean the surface using the cloth paper and the Isopropyl alcohol. • AL Tape (3M 425) Kapton tape (either folded around TC or bottom piece stuck on surface first) AMS Figure 10 – General TC mounting technique ST1 ST TC#3 ST TC#4 Figure 11 – ST TC #4 position on the electronic frame interface 7.2 SENSOR FIXATION

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	AMS-02 TASK SHEET (A	4. ATS NO.	TCS(	000001-1-	-15				
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7.2.1	Take one of the available T	(Print, Type, or Write Legibly)  Cs and fill the tabl	e:		22. TECH	23. QA/DV			
	TC identification number	Part number	Location of the TO electronic frame in						
	ST TC #4	N/A	As in Figu	re					
7.2.2	Wrap the thermocouple in a sma position it on the subdetector Ol surface, on the clean area, cente with a larger piece of Kapton ta	R put a piece of Kar the thermocouple	apton tape on the su	ıbsystem					
7.2.3	Take a photo to show the exact	configuration.							
7.2.4	Cover the thermocouple and Ka fix it firmly in place (recommen								
7.2.5	Take a photo								
7.2.6	Record the photos files numbers ST TC #4, TC fixation photos		STTC#4_sect_7.2. STTC#4_sect_7.2.						
7.2.7	According to the Star Tracker installation position, report the cabling layout in the Figure 12. Fix the cable using Aluminum tape. Typically one piece of tape every 20 cm.								
		WARNING							
	BEFORE TO PUT THE A WITH								
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#### 16 16 5. Page TCS000001-1-15 **AMS-02 TASK SHEET (ATS)** 4. ATS NO. **CONTINUATION PAGE** 6. MOD NO. VERIFICATION

20. OPER 21. OPERATIONS SEQ. NO. (Print, Type, or Write Legibly) 22. TECH 23. QA/DV ST TC#3 ST TC#4 Figure 12 – ST TC #4 cable fixation. 7.2.8 Take pictures of the cables layout and record the photos files numbers: ST TC #4, cable fixation photos files numbers: STTC#4 sect 7.2.8.jpg 7.3 TC IDENTIFICATION. Put the TC identification number "ST TC #4" 10 cm far from the cable end using the cable label. If the thermocouple and cable on AMS will be hidden later, place a second label near where the cable will emerge, if this location is known. 7.4 TC VERIFICATION AFTER INSTALLATION Check the functionality of the TC and fill the table: TCPart Measure Datasheet Temperature identification OK value (°C) number d value value number ST TC #4 N/A 23.5 25.5 OK 7.5 Touch TC head with gloved hand to check that temperature rises.